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(12) UK Patent Application (19) GB (11) 2 085 381 A

(21) Application No 8127377
(22) Date of filing 10 Sep 1981
(30) Priority data
(31) 3034130
(32) 11 Sep 1980
(33) Fed. Rep of Germany (DE)
(43) Application published 28 Apr 1982
(51) INT CL³ B60K 9/04 // F02N 5/04 F03G 3/08
(52) Domestic classification B7H A5 C2 C9H C9K5 V2A F1K 2F16 4A3 4C3 F2C 1C4C1 1C9A2 1C9B1 1C9B2 1E2 1E3 1E7 F2L 4B 7B 8B2U F2X 6
(56) Documents cited GB 2054491 A GB 2047816 A GB 2031822 A GB 2006702 A GB 1512949 GB 1429542
(58) Field of search B7H F1K F2C F2L

(71) Applicants Ford Motor Company Limited, Eagle Way, Brentwood, Essex.
(72) Inventors Herbert Kanlut
(74) Agents Robert William Drakeford, Ford Motor Company Limited, 15/448, Research & Engineering Centre, Laindon, Basildon, Essex.

(54) **Transmission mechanism for a motor vehicle**

(57) A transmission mechanism for a motor vehicle comprises a first flywheel (S1) which, in use, is connected to the motor vehicle engine (1), a second flywheel (S2) mounted for free rotation, a first clutch (k2) for effecting a driving connection between the first and second flywheels, a second clutch (k1) for effecting a driving connection between the first flywheel (S1) and the motor vehicle transmission (3), a free-wheel device (F) for transmitting rotational movement from the first flywheel (S1) to the motor vehicle transmission in one direction of rotation only, and an actuating mechanism (36,39,41,42) operable in response to the movement of an accelerator pedal (31) for switching off the engine and disengaging the first clutch (k2) when the accelerator pedal is

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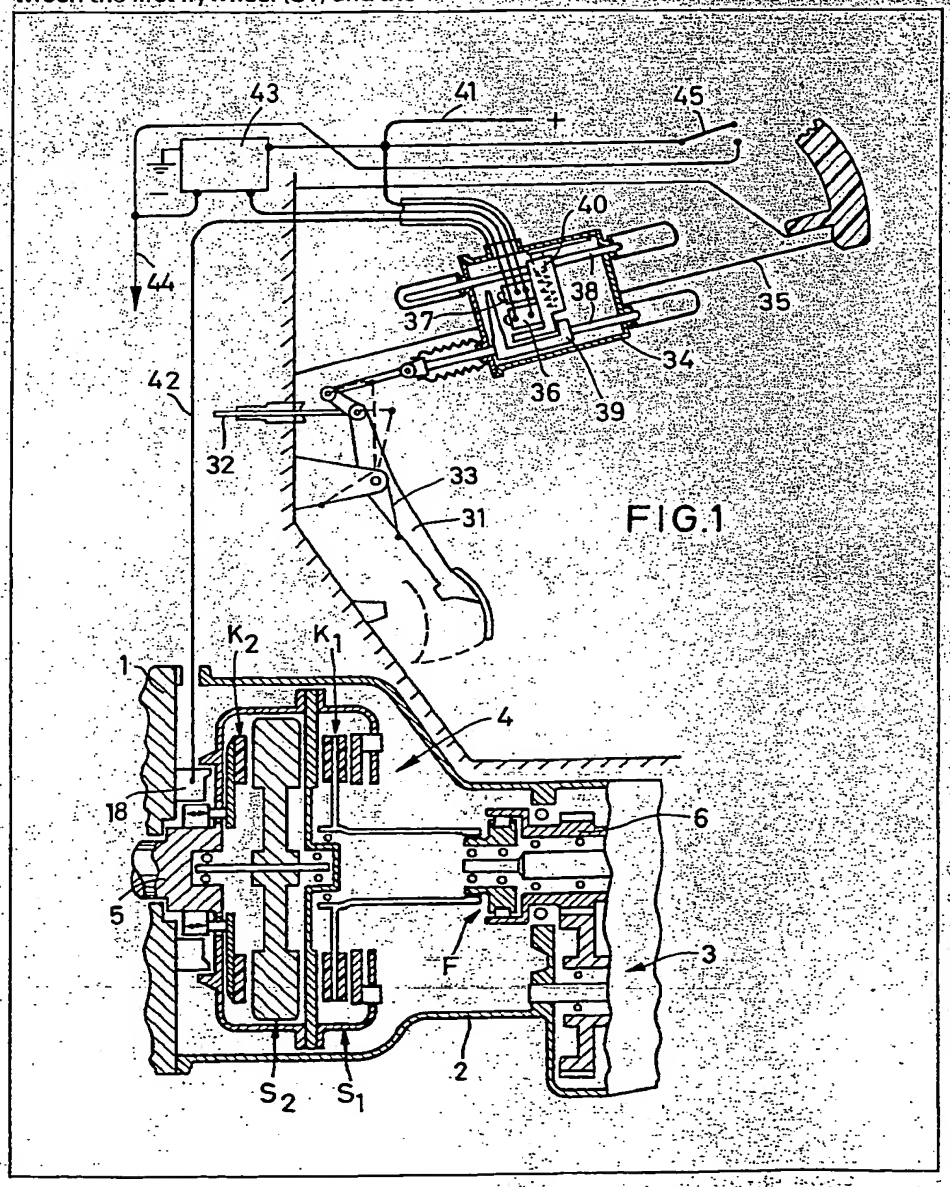

FIG.1

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released and for re-engaging the first clutch when the accelerator pedal is depressed again.

A time switch (43) ensures that the engine is not switched off when the accelerator pedal is temporarily released during a gear change. The engine is restarted by the rotational energy of the second flywheel (S2) when the driver depresses the accelerator pedal. The second clutch (k1) and freewheel device (F) may be replaced by a hydrokinetic torque connector.

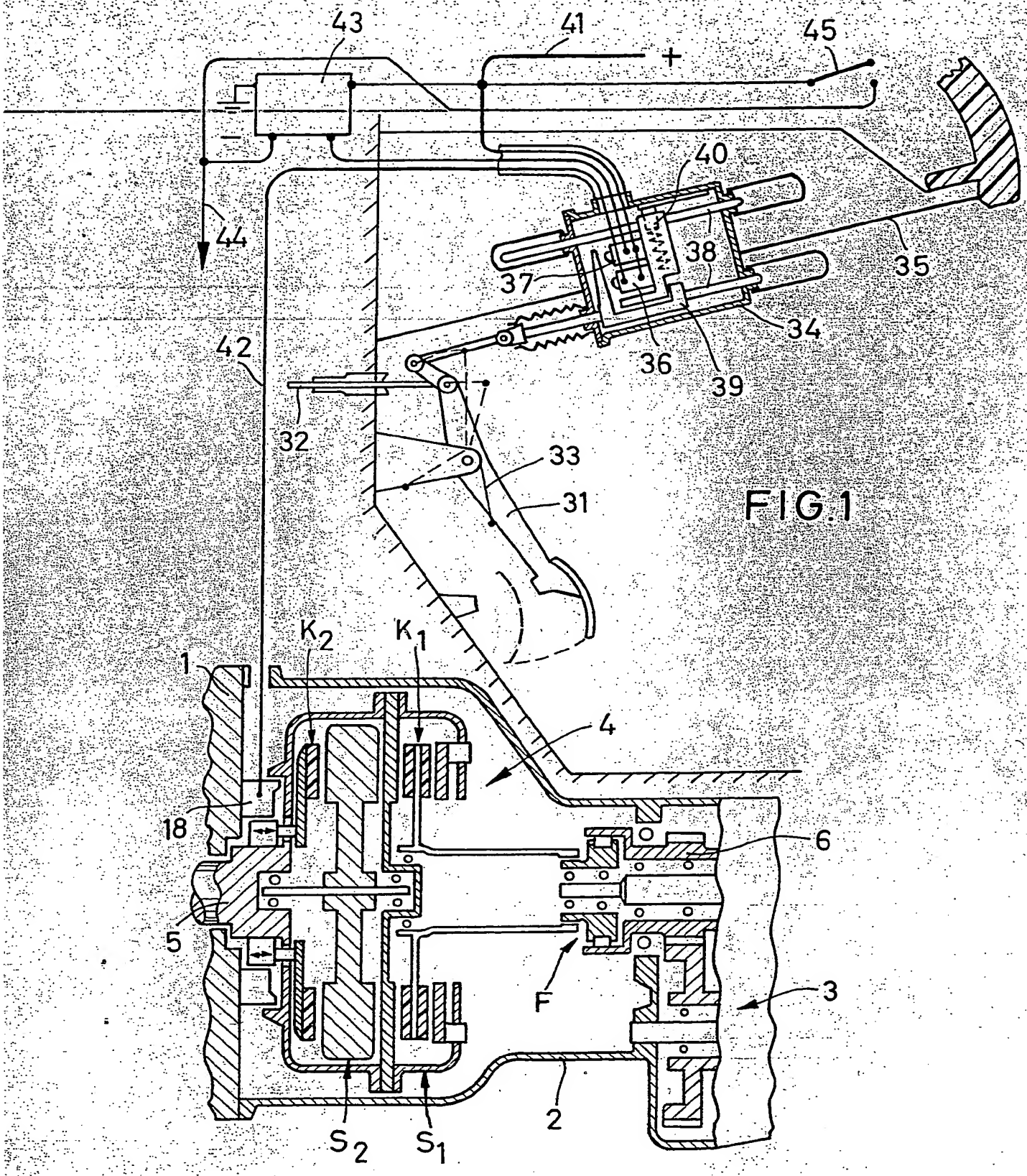
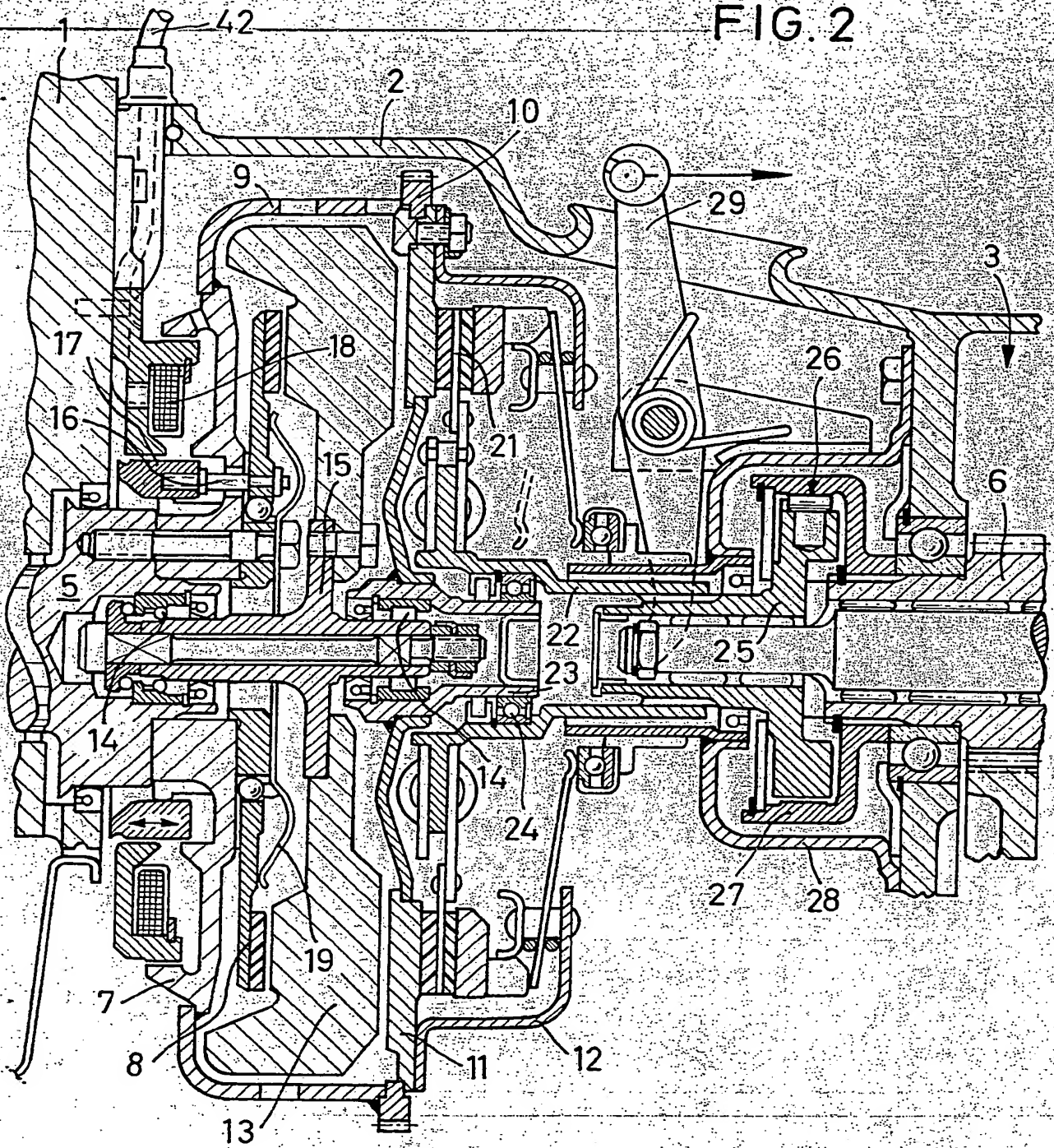


FIG.1

FIG. 2



SPECIFICATION

Transmission mechanism for motor vehicles

Description

The invention relates to transmission mechanisms for motor vehicles.

The publications "Auto-Motor-and Sport" No. 23 of 7th November 1979, pages 44 and 46, and "Automobilrevue" No. 23 of 29th May 1980, page 45 describe a transmission mechanism for a motor vehicle which make it possible to switch off the engine of the vehicle automatically during stops in traffic and to restart it quickly and easily merely by depressing the accelerator pedal. This operation is achieved by providing a freely pivoted flywheel in the transmission mechanism which can be connected to the gear change mechanism by a first clutch and to the internal combustion engine by a second clutch both of which are actuated by means of vacuum operable servo-devices.

This mechanism has the disadvantage that its construction is relatively complicated and it utilises a relatively expensive control system.

According to the invention there is provided a transmission mechanism for a motor vehicle comprising a first flywheel which, in use, is connected to the motor vehicle engine, a second flywheel mounted for free rotation, a first clutch for effecting a driving connection between the first and second flywheels, a second clutch for effecting a driving connection between the second flywheel and the motor vehicle transmission, a freewheel device for transmitting rotational movement from the second flywheel to the motor vehicle transmission in one direction of rotation only, and an actuating mechanism operable in response to the movement of an accelerator pedal for switching off the engine and disengaging the first clutch when the accelerator pedal is released and for re-engaging the first clutch when the accelerator pedal is depressed again. As a result of the use of two clutches and two flywheels, the use of two costly servo-operated clutches in unnecessary. The vehicle can also continue to be used normally even in the event of failure of the servo-power.

Through the provision of two flywheels, the advantage is achieved that during a normal gear change with the aid of the second, or gear change, clutch only the mass of the first flywheel must be accelerated or retarded and the acceleration of the first flywheel takes place after the gear change process largely through the kinetic energy of the second flywheel mass, which also saves fuel during the gear change. Since the first, or flywheel, clutch is also engaged only after engagement of the gear shift clutch and depression of the accelerator pedal, the internal combustion engine works during its normal operation with an increased flywheel mass which contributes to quieter engine running during the journey.

The first flywheel, clutch can preferably take the form of an electro-magnetic clutch but it is of course possible to use other forms of servo-activated clutch for example, pneumatic or hydraulically activated clutches.

The second clutch is preferably in the form of a conventional friction disc clutch. The second clutch can however, also take the form of a conventional hydraulic clutch or a hydrokinetic torque converter if an infinitely variable or planetary gear is used. The hydraulic clutch or hydrokinetic torque converter also acts as the freewheel device.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a mechanism device according to the invention in which the main components are represented schematically; and

Figure 2 is a more detailed cross-section through a mechanism in accordance with Figure 1.

In Figure 1 the engine block of an internal combustion engine is connected via a housing 2 with a gear change mechanism 3 forming part of the motor vehicle transmission. In the housing 2 the transmission mechanism 4 according to the invention is disposed between the crankshaft 5 of the internal combustion engine and the primary shaft 6 of the gear change mechanism 3. The transmission mechanism comprises basically a first flywheel S1 which is firmly connected with the crankshaft 5 and a second flywheel S2 which is disposed freely pivoted within the first flywheel. The transmission mechanism 4 also comprises a starting and/or gear shift clutch K1, which is engagable on the one hand with the first flywheel S1 and on the other hand is connected to the gearbox primary shaft 6 via a freewheel device F. The transmission mechanism also comprises a servo-activated flywheel clutch K2 which is disposed between the first flywheel S1 and the second flywheel S2.

In the present embodiment the servo-activated clutch K2 is in the form of an electro-magnetic clutch which is activated by means of an electric control system.

In order to explain the transmission mechanism arrangement in greater detail, its structure is now described in association with Figure 2.

The first flywheel S1 comprises a hub 7 firmly connected with the crankshaft 5, a bell housing 9 with a starter gear rim 10, a cover plate 11 and the rotating part 12 of the starting and gearshift clutch K1. The axially movable friction disc 8 of the servo-activated flywheel clutch K2 is mounted within the bell housing 9. The second flywheel S2 consists of a solid flywheel 13 disposed within the bell housing 9, its hub 15 being freely pivoted on the one hand in the crankshaft 5 and on the other hand in the cover plate 11 via roller bearings 14. The bearing of the hub 15 by means of the roller bearings 14 must on the one hand ensure the freest possible rotation of the flywheel 13, but on the other hand absorb axial forces from the engaged flywheel clutch K2.

The servo-activated flywheel clutch K2 is in the form of an electromagnetic coupling of which the movable friction disc 8 is connected by means of pressure pins 16 with a ring armature 17, which lies in the air gap of a circular electromagnet 18 fixed on the engine block 1. As soon as the electromagnet 18 is activated it presses the friction disc 8 against the

force of a release spring 19 in friction engagement with the flywheel 13.

The starting and gear shift clutch K1 is in the form of a conventional friction disc coupling, of which the friction disc 21 is disposed on a hollow clutch hub 22 which is pivoted on the one hand on a projection 23 on the cover plate 11 by means of a roller bearing 24 and on the other hand is connected with an inner ring 25 of a freewheel device F in the form of a grip roller freewheel 26. The outer ring 27 of the grip-roller 26 is here connected with the gearbox primary shaft 6 and the whole grip-roller freewheel 26 is preferably disposed within the clutch housing 2 in a freewheel housing 28 which is advantageously connected with the oil chamber of the gear change 3.

The activation of the starting and gear-shift clutch K1 is effected in conventional manner by means of a clutch release bearing - withdrawal level arrangement 29.

The mode of operation of the stopping and starting device for the internal combustion engine of a motor vehicle according to the invention is now explained with reference to Figures 1 and 2.

In this respect the electrical control system indicated in Figure 1 is explained first. The accelerator pedal 31 of the motor vehicle which, for example, by means of a flexible control cable 32 moves the throttle valve of the internal combustion engine and is kept in a specified rest position by a return spring, is connected by a mechanical linkage with a switching arrangement 34 which, for example, can be fixed on the underside of the dashboard 35 of the motor vehicle.

The switching arrangement 34 has a switch 36 for a switching circuit 42 of the electromagnetic coupling and a switch 37 for a switching circuit 44 for the ignition and/or the fuel feed of the internal combustion engine. The two switches 36 and 37 are here slidably disposed within the switching arrangement 34 along switch guides 38 via a switch pole return piece 39 or a switch support 40. The switch pole return piece 39 is here so constructed that when the accelerator pedal 31 is depressed the two switches 36 and 37 are first activated, whereupon during a further movement of the accelerator pedal the switch and the switch support 40 are moved together along the switch guides 38. The switch support 40 makes a constant contact with the positive wire 41 which comes from the conventional ignition lock of the motor vehicle. A further time switch 43 and a selector switch 45 is switched into the circuit 44 for the ignition and/or the fuel feed of the internal combustion engine.

We shall now consider the function of the transmission mechanism. We start from the fact that the internal combustion engine of the motor vehicle was started in conventional manner by means of the electro-starter and the motor vehicle is in motion. As soon as the driver of the vehicle wants to reduce speed he will release the accelerator pedal 31, and because of this the switches 36 and 37 activated when the accelerator pedal 31 is depressed are opened. Thus the switching circuit 42 to the electromagnetic clutch K2 is directly released. Because of this, the second flywheel S2 will continue to rotate at the original speed, whilst the rotational speed of the internal combustion engine and the vehicle is already decreased. The circuit 44 for the ignition and/or the fuel feed of the internal combustion engine is at first not yet interrupted since the time switch 43 only does this after a specified delay. The delay of the time switch 43 is here preferably adjustable and is set in such a way that the ignition or the fuel feed is not switched off during a time-span which is required for a normal gear change. It could in fact be that the driver has only released the accelerator pedal because he wanted to carry out a normal gear change with the starting and gear shift clutch K1. As soon as he again depresses the accelerator pedal after completing a gear change, the electromagnetic clutch K2 is engaged.

However, if the release of the accelerator pedal 31 was not due to a gear change and the time span set by the time switch 43 for this purpose is exceeded, the time switch 43 interrupts the circuit 44 and with it the ignition and/or the fuel feed to the internal combustion engine. The motor vehicle thus continues moving with the engine stopped, electromagnetic clutch K2 released and with the starting and gear shift clutch K1 still engaged, whereby the freewheel device F ensures that the moving vehicle does not have to activate the engine. The vehicle will thus not use any fuel when travelling down a gradient with the accelerator pedal released and with the engine switched off.

If the driver now wishes to increase speed again then he only has to depress the accelerator pedal 31 whereby the electromagnetic clutch K2 is engaged and the ignition and/or the fuel feed for the internal combustion engine is re-established, whereby the engine will be started without difficulty by the momentum of the flywheel mass S2 which is still rotating at the original speed.

However, if the driver reduces speed by braking to the extent that the vehicle comes to a halt, as, for example, at a red traffic light then he will disengage the starting and gear shift clutch K2 in the accustomed manner shortly before the vehicle comes to a halt and disengage the gear. The engine is now automatically switched off and uses no fuel. As soon as the driver wants to continue his journey when the traffic light is green he will disengage the starting clutch K1 in the customary manner, put in the gear and activate the accelerator pedal. At this moment the electromagnetic clutch K2 is immediately engaged and the internal combustion engine is started by the flywheel S2. The time-span normally required for the gentle engagement of the starting clutch K1 is sufficient for starting the internal combustion engine.

The driver can thus continue his journey without delay. The stopping and starting device according to the invention has the advantage that the driver can operate his vehicle completely in the accustomed manner.

CLAIMS

1. A transmission mechanism for a motor vehicle comprising a first flywheel which, in use, is con-

nected to the motor vehicle engine, a second flywheel mounted for free rotation, a first clutch for effecting a driving connection between the first and second flywheels, a second clutch for effecting a driving connection between the second flywheel and the motor vehicle transmission, a freewheel device for transmitting rotational movement from the second flywheel to the motor vehicle transmission in one direction of rotation only, and an actuating mechanism operable in response to the movement of an accelerator pedal for switching off the engine and disengaging the first clutch when the accelerator pedal is released and for re-engaging the first clutch when the accelerator pedal is depressed again.

2. A mechanism according to Claim 1 wherein the first flywheel comprises a hollow housing within which the flywheel is rotatably mounted.

3. A mechanism according to Claim 2 wherein the first clutch includes a clutch plate mounted within the hollow housing of the first flywheel.

4. A mechanism according to any one of Claims 1 to 3 wherein the first clutch is operable by an electromagnetic servo-mechanism.

5. A mechanism according to any one of Claims 1 to 4 wherein the second clutch and the freewheel device is constituted by an hydraulic clutch or torque converter.

6. A mechanism according to any one of Claims 1 to 5 wherein the actuating mechanism includes a time delay device for delaying the disengagement of the first clutch after the accelerator pedal has been released.

7. A mechanism according to Claim 6 wherein further comprising means for cancelling the operation of the time-delay device.

8. A mechanism according to any one of Claims 1 to 7 wherein the actuating mechanism comprises a contact member mechanically connected with the accelerator pedal which on the one hand activates switches fixed on a switch support and on the other hand moves the switch support in accordance with the movement of the accelerator pedal in one direction along a switch guide, the switch support remaining in position when the accelerator pedal is released, and a return member which opends and then moves the switch support back into its starting position when the accelerator pedal is released.

9. A transmission mechanism substantially as hereinbefore described and as illustrated in the drawings.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1982.
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